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Old Crow

SEWAGE DISPOSAL PRACTICES FOR FEDERAL FACILITIES AT OLD CROW, YUKON TERRITORY

by

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SUMMARY

Raw sewage from Federal Facilities at the Village of Old Crow, Yukon Territory, is presently being discharged on a batch basis to the community dump and an adjacent river. These methods of handling and disposal constitute a nuisance problem and potential health hazard and as such are considered unacceptable.

Raw sewage from non-Federal facilities are handled in a similar manner.

An integrated sewage haulage and lagoon disposal system involving both Federal and non-Federal facilities is recommended as the most practical solution.

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ASSESSMENT OF SEWAGE DISPOSAL PRACTICES FOR FEDERAL FACILITIES AT OLD CROW, YUKON TERRITORY

1. INTRODUCTION

Old Crow is a native village located at the junction of the Porcupine and Old Crow Rivers about 75 miles above the Arctic Circle. It is relatively isolated being accessible only by aircraft and by boat (barges) during the summer months.

Federal establishments in the community consist of an R.C.M.P. Detachment and a Nursing Station operated by Health and Welfare Canada and a Yukon Forest Service Station (DINA). There is also a mobile home trailer maintained by the Canadian Wildlife Service that is used periodically by personnel involved in studies in the surrounding area. Fisheries and Marine Service have a laboratory-accommodation trailer at the west end of the community but it is not in use and Water Survey of Canada have a small cabin in the community.

Figure 1, is a site plan of the community and Figure 2 is an aerial view of the majority of the community.

Resulting from requests made by the R.C.M.P. to upgrade the sewage disposal practice at their detachment, a trip was scheduled to assess the facility. While at the community, the waste disposal methods from the other Federal Facilities were examined and their assessment will be included in this report. As well, sewage disposal methods used by the school and teacherage, operated by the Government of the Yukon Territory, and the community in general will be discussed.

2. WATER SUPPLY

The community has no piped water distribution system or piped sewage collection system. The R.C.M.P. Detachment, nursing station, Yukon Forest Service, C. W.S. and school pump water from the Porcupine River to tanks in the building using gasoline powered pumps and portable hoses. Bleach is used to disinfect the contents.

Other members of the community carry water in buckets or have it delivered in 45 gallon drums. Ice is used in the winter and sometimes creeks in the area are used if the Porcupine River is to silty.

3. SEWAGE DISPOSAL

3.1 R.C.M.P. Detachment

Sewage from the building flows to a two compartment septic tank located in the utility room. Up to last year the contents of the tank were pumped out of the building and through an overhead insulated line about 300 feet long to a small pond between the community and the airstrip. This line gave continual trouble in the winter months, with breakages and freezing and recently the Native Band requested that the R.C.M.P. cease using the pond as it was on their land.

Detachment personnel now haul the septic tank contents in 45 gallon drums on the back of their truck to the community dump. Haulage is carried out once a week and about 4 trips to the dump with 4 drums per trip are made. The estimated amount is 600 gallons per week.

The pump out connection is in the same room as the potable water tank and the hose from the connection to the containers on the vehicle has to pass over the water tank and is extremely close to an access hatch to the water tank hatch. Piping is 1½" I.D. copper.

At present five persons occupy the detachment building; two members of the force, one with a family. They are practicing water conservancy as much as they can by such things as flushing the toilet only after several uses.

3.2 Nursing Station

Sewage from the station is collected in a holding tank in the building. It is equipped with an electric discharge pump with a 1" I.D. steel discharge pipe going to a connection on the outside of the building. Periodically, every two to three weeks, a hose is connected to the fitting and the tank contents pumped to the Porcupine River. It discharges to a small hole just below the river bank in an area that is normally above the water level. The distance to the water, when observed on June 18, 1974, was about 150 feet. The sewage reportedly disappears into the ground before reaching the river. It should be mentioned that the whole region is in the zone of continuous permafrost so the liquid could not penetrate very far vertically. Also, in winter time the sewage would flow over the ice and snow and eventually freeze. Figure 3, Appendix A, shows the nursing station viewed from the river bank.

Water for the nursing station and the school is pumped from the river immediately downstream of the discharge.

3.3 Forestry Station

This facility operated by the Yukon Lands and Forests Service of the Northern Natural Resources and Environment Branch, DINA, consists of a residence building and garage with additional accommodation. Each building has a holding tank for sewage, 300 to 400 gallons capacity, which is pumped out as necessary. This is accomplished by a portable gasoline powered pump with a hose dropped in the tank and the liquid is transported to the community dump in 45 gallon drums on the back of a pick-up truck.

At the present time one person occupies the facility.

3.4 Canadian Wildlife Service Trailer

The Canadian Wildlife Service maintains a mobile home type trailer at Old Crow for use by its personnel on field studies in the surrounding area. It is also available for use by other government personnel and the useage is estimated at 2 to 3 days per month.

Sewage wastes including wash-water are discharged to a subsurface system.

Water for potable purposes is pumped from the river as required to a tank in the trailer.

The Water Survey of Canada cabin has no facilities. It is used infrequently and the personnel use the toilet at the school.

3.5 Non-Federal Facilities

A brief description of the sewage disposal at other facilities in the community is given for background information.

3.5.1 School and Teacherage

A 600 to 800 gallon holding tank collects the waste from this facility which is operated by the Government of the Yukon Territory. Once a day this tank is pumped out over the edge of the river bank through a fire hose connected to the pump discharge that projects through the wall of the boiler room. Figure 5, Appendix A, shows the discharge point and fire hose used for the purpose. Previously, sewage was pumped into a leaching pit but the system froze up in the winter.

In summer the sewage flows in a depression in the river channel, above the normal water level, to the river. In winter it flows over the ice and freezes. It is in close proximity, (about 100 feet) from the main water source for the community. Figure 6, Appendix A, shows the proximity of the sewage disposal area to the water supply point.

3.5.2 Co-op Store

The store, run by the Indian Band, has a holding tank, which is emptied periodically into 45 gallon drums and taken to the community dump.

3.5.3 The rest of the community uses earth privies and bucket toilets. The bucket toilet wastes are removed with the solid wastes to the community dump or dumped near the individual houses. The Anglican Priest's residence has a holding tank which is pumped out periodically in the summer to his pit privy. In the winter the tank has freezing problems due to inadequate insulation and the pit privy is used. The Y.T.C has a maintenance facility in the community with a one man residence. Sewage is disposed of in a subsurface system which was installed in 1974.

4. SOLID WASTE DISPOSAL

The Federal Facilities burn their garbage in 45 gallon drums and the residue is removed periodically to the community dump. The removal service is provided by the Territorial Government maintenance man in the community. The dump is located to the northwest of the community on the other side of the airstrip (see Figure 1). It is an open dump and appears to be reasonably well looked after. This has since been relocated to a site at the west end of the community.

5. DISCUSSION

The methods presently used for sewage disposal at

the Federal Facilities cannot be considered acceptable. The haulage of sewage in 45 gallon drums on the back of a pick-up truck as practiced by R.C.M.P. and Forestry personnel creates a health hazard to the operators and is a very impractical process, especially in winter conditions. Dumping these wastes in the community dump also creates a health hazard and a high nuisance factor to others using the dump. Discharge of raw sewage by the nursing station to the river bank upstream of one of the community water intakes creates a potential health hazard and it should be stopped. It is acknowledged that it appears that the sewage never enters the river directly during the summer, however, it does freeze on the surface in winter and the fact that the discharge is immediately upstream of the water intake should warrant its' removal.

In the R.C.M.P. Detachment building the present pump out system creates a potential hazard to the building's water supply. The access hatch for the water tank is between the outside access hatch and the sewage discharge hose connection point, requiring that the hose be dragged across the water tank when pump-out takes place.

Since the community is not in a position to provide a piped water distribution and sewage collection system and subsurface disposal systems are not practical due to the continuous permafrost in the region, the method recommended for sewage disposal is an improvement to the haulage systems now in use. This could best be accomplished by a single tank unit

mounted on a trailer or the back of a truck with the contents being disposed of in a small lagoon or sump away from the community in the vicinity of, but separate from, the garbage dump. Previous reports (1) and (2) have recommended haulage systems for the community.

As it is not practical for the Federal Facilities to operate their own haulage services and since there are several non-federal facilities with holding tanks, the Yukon Territorial Government school, the Co-op, and the Anglican Priest's residence, the haulage system should be set up to be operated on a contract basis and include the non-federal establishments. It should also be set up to permit additional establishments, both government and private, to take advantage of should they acquire holding tanks. Discussions with the Territorial Government to date have resulted in their willingness to fund the mechanical collection equipment and to negotiate a contract with the Co-op to operate the system. It is expected that the various Federal Facilities would contribute to the annual haulage charges.

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(1) Report on Sewage and Garbage Disposal, Old Crow, Y.T. by J.W.Grainge, P.E., E.P.S. Northwest Region, August 1972.

(2) Pollution Abatement in the Yukon Communities, Stanley Associates Engineering Ltd., Edmonton, May 1973.

Table 1: Sewage Volume Estimates

Facility		Weekly Sewage Volume
R.C.M.P.	Pump out about once a week. 3 adults, 2 children	600
Nursing Station	Pump out every 2 to 3 weeks. 1 person	250
Forestry	Pump out as required 1 person	250
C.W.S.	Infrequent use	-
F & M.S.	Not in use	-
School	Pump out daily 3 teachers, about 75 children	3,250
Co-op	2 persons	500
Anglican Priests Residence	1 person	250
Y.T.G. Maintenance residence	1 person	250
		5,350

Total yearly flow estimate 278,200 gallons

6. DESIGN CONSIDERATIONS

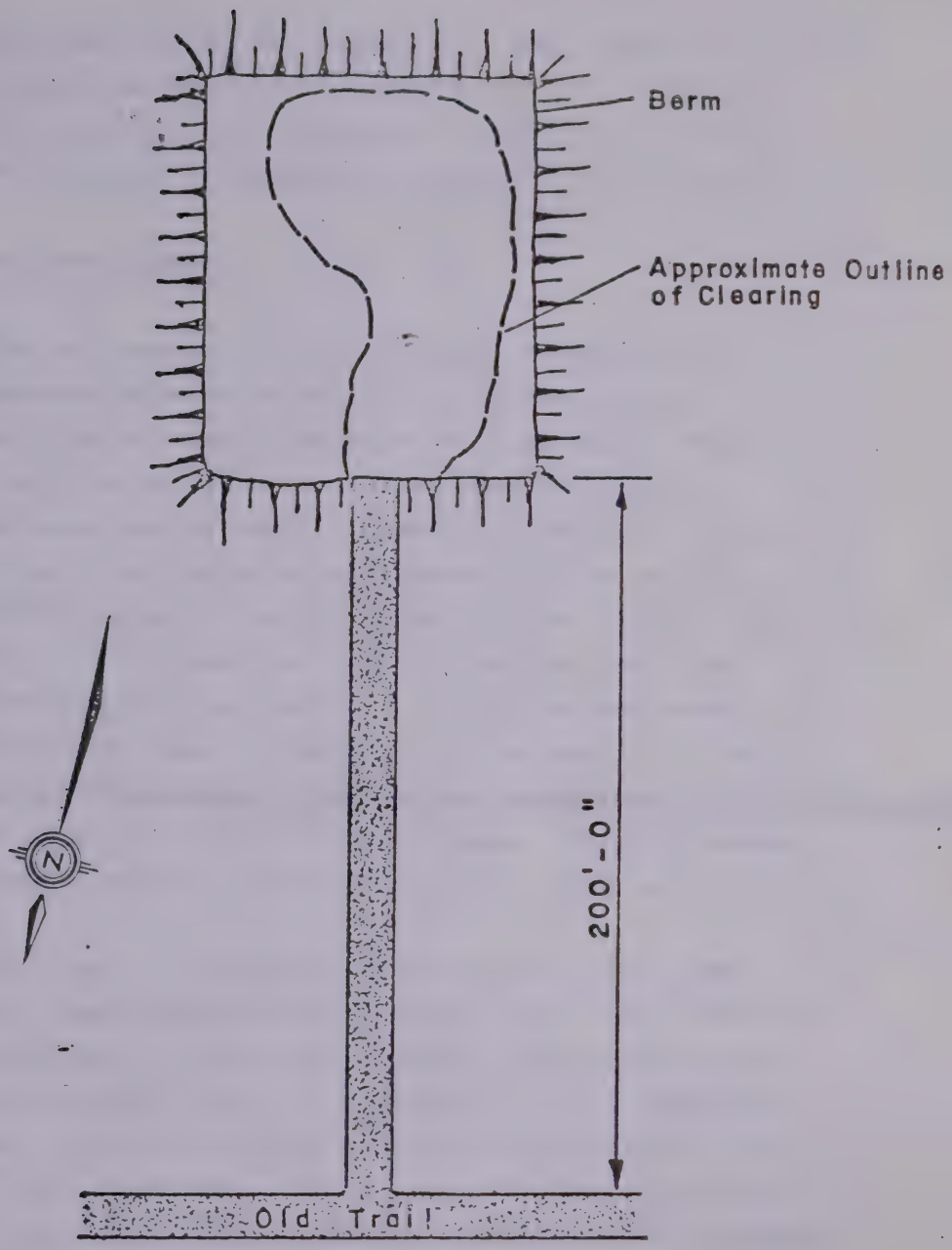
6.1 Sewage Volume Estimates

Table 1 shows the estimated sewage volumes for the facilities with holding tanks. These volumes are difficult to estimate as most of the facilities appear to practice water conservancy. The R.C.M.P. reduce the flushing frequency of their toilets and the school toilets are set to give a reduced flushing volume.

6.2 Haulage Tank

Suggested size: 1,000 Imperial Gallons (min. 750 gallons). The tank could be mounted either on a trailer or the back of a truck. It should be fitted with a vacuum pump so that those facilities without discharge pumps (Forestry and Co-op) could be serviced. It is envisaged that those facilities with discharge pumps should retain them, but the discharges be repiped to allow vacuum collection with the pumps kept for emergency purposes. The tank would have to be used daily by the school and other pump-out requirements could be staggered to permit one additional pump-out per day.

The tank will most probably require heated storage for the winter and the external fittings, such as vacuum pump, discharge, etc., would have to be enclosed in an insulated housing to reduce



SKETCH OF PROPOSED SEWAGE DISPOSAL AREA

(Refer to Figure I for Location)

Scale: 1" = 50'-0"

the possibility of freezing. The inlet should use 3 inch diameter hose with Kamlok fittings and the discharge should be at least 4" diameter to prevent plugging and freezing.

6.3 Storage Lagoon

The optimum size for the lagoon would be to provide a years storage for the sewage, to provide as much treatment as possible. There should be no inlet or discharge facilities, to keep the system as simple as possible, and if any discharge were necessary this could be accomplished prior to freeze up in the fall by means of a gasoline driven pump on the dyke surrounding the lagoon. Using the estimated sewage volumes in Table 1 for a year's storage (278,200 gallons), the lagoon dimensions would be about 110' x 110' by 5' deep. This is assuming a square lagoon with 3 to 1 slopes.

The land in the western portion of the community was examined for lagoon sites and, referring to Figure 1, there is a small area northwest of the airstrip that is suitable. It is about 200 feet south of an old trail running off the end of the airstrip. It is a small clearing in the willow brush that abounds in the area and appears to be very slightly depressed with respect to the surrounding terrain. The cover is hummocky grass and is quite swampy. It would be necessary to remove the grass and scrub and deepen it as

much as possible to get the necessary volume and then build up berms with the material used for the airstrip and the roads in the area. This material becomes rather hard when dry and there should be little seepage through the berm once it has had a chance to dry before the sewage is dumped in the lagoon. There is always the possibility that the permafrost zone might migrate into the berm and create a partial barrier. In the area it is about 1.0 to 1.5 feet below the ground surface. It could be deeper in the wet area in the centre of the clearing.

The dimensions of the clearing are about 50' by 65' and this could be expanded to about 80' by 65' due to the nature of the clearing. While this would not give the optimum storage volume discussed above, it is considered to be adequate. With removal of material from the clearing and building up a berm, a 3' to 4' water depth should be obtained.

6.4 Modifications to Existing Discharge Points

The provision of a haulage service will require that all the discharge points have a standard connection fitting. Also, some of the facilities will require some re-plumbing to make the discharge points accessible to the pump-out truck. A 3" diameter Kamlok fitting system is recommended for the connection points and as discussed earlier, the discharge pumps at the R.C.M.P., nursing station, and Y.T.G. school facilities should be kept in place for emergency purposes

to pipes to the bottom of the tanks with the Kamlok fittings at the upper end.

6.4.4 School

The present discharge point is accessible to a pump-out vehicle so all that is necessary is to place a Kamlok fitting on the 3" copper pipe through the building wall. A bypass around the discharge pump could also be installed.

6.4.5 Co-Op

The holding tank at this facility has a 3" valve at the discharge which is accessible through a hatch in the outside wall of the building. All that would be necessary is a 3" Kamlok fitted to it.

6.4.6 General

All the Kamlok fittings referred to above are male fittings; the discharge hoses would have the female ends. Also, each of the discharge fittings should be provided with a cap to protect the connection point.

If additional facilities install holding tanks, their discharge connection points can be matched to the haulage vehicle.

7. COST ESTIMATES

7.1 Haulage Equipment

The estimated cost figures for the mechanical equipment are:

Tank Unit (Trailer Mount), includes pump	$5,000
Heated Building	6,000
Miscellaneous Fittings	1,000
Building Erection	1,000
	$13,000
Air Delivery from Whitehorse (Air Charter)	4,000
Truck Chassis for 1000 Gallon Tank	10,000
	$27,000

7.2 Lagoon Construction

Referring to the attached sketch plan of the cleared area, the rough estimates for earth removal and berm construction are as follows:

Clearing and earth removal	
400 yard^3 @ $3.00 yd.^{3}	$1200
Berm Construction 100 yd.^{3} @ $2.00 yd.^{3}	2000
Access Road from trail to lagoon site	
200' @ $4.50/ft.	900
Road along trail from present end to	
lagoon access 600' @ $4.50/ft.	2700
Miscellaneous	1000
TOTAL	$7800

The above costs do not reflect transportation of equipment to the site.

The Territorial Government has heavy equipment in the Community that would be suitable for the purpose and it is expected that it will be used. The above estimated costs reflect the material moving costs at Old Crow.

7.3 Modifications to Building Pump-Outs

The costs for the converting of the present discharges to the standardized will not be great and should be covered by the owner departments.

It is suggested that, due to the limited access to the community, all the re-plumbing be carried out in one project.

8. CONCLUSIONS

It is concluded that:

1. The present hauling methods used by the R.C.M.P. and Yukon Forest Service personnel for their sewage is not acceptable from a human health consideration.
2. Disposal of the raw sewage in the community dump area creates a health hazard to other users.
3. The disposal of raw sewage from the nursing station to the river bank above the water supply location creates a potential health hazard.
4. The disposal methods used by the Y.T.G. school and community Co-op also cannot be considered acceptable.
5. The community is not in a position to provide piped water distribution or sewage collection systems to which the Federal establishments can connect and individual subsurface disposal systems are not practical.
6. A properly designed and operated sewage haulage system which the Federal facilities and other establishments can make use of is considered the most practical solution.

9. RECOMMENDATIONS

It is recommended that:

1. A sewage haulage vehicle consisting of a vacuum eductor tank on a trailer or back of a truck be acquired for the community.
2. A sewage disposal lagoon into which the hauled raw sewage can be dumped be constructed away from the community and separate from the community garbage dump.
3. The discharge systems at the Federal facilities with holding systems and the Y.T.G. school and community Co-Op be standardized to be compatible with the sewage collection vehicle.

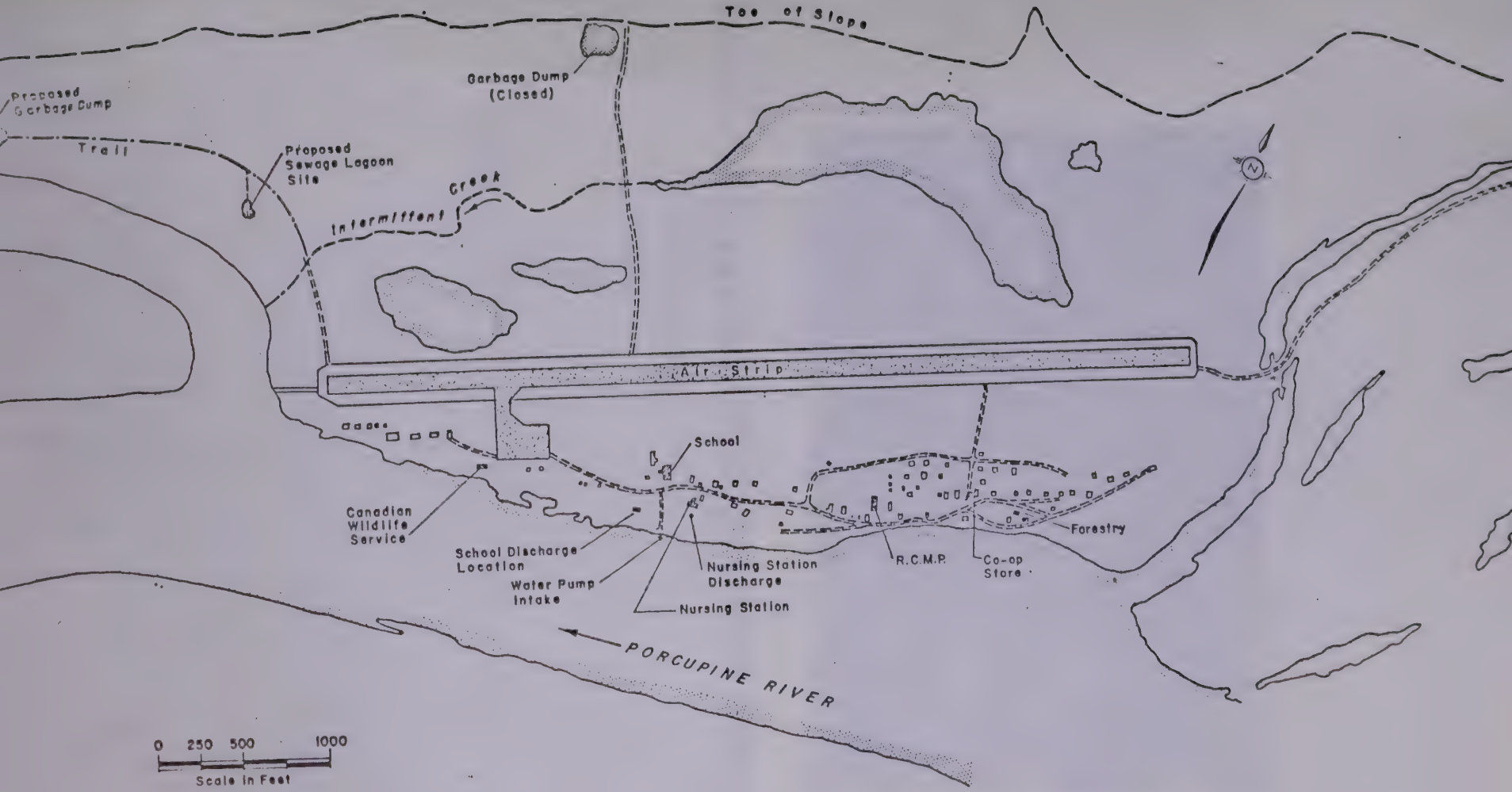


FIGURE 1 OLD CROW - SITE PLAN

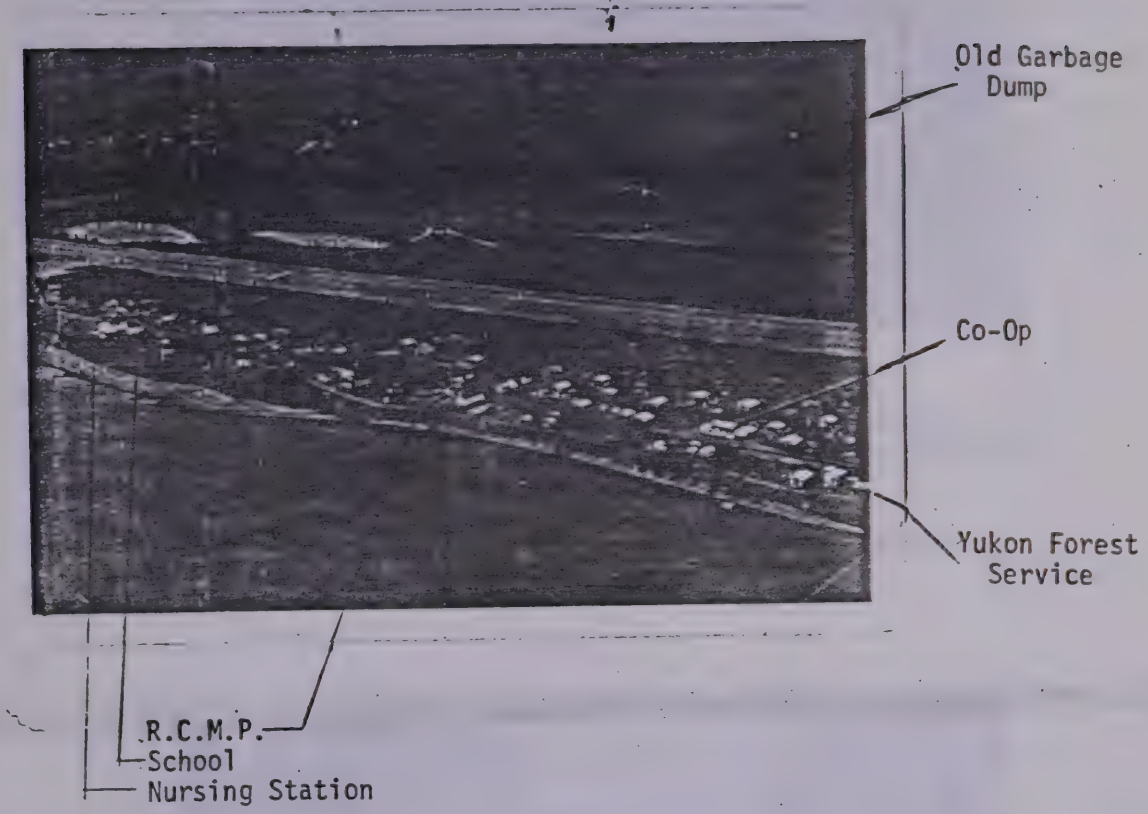


FIGURE 2: COMMUNITY OF OLD CROW

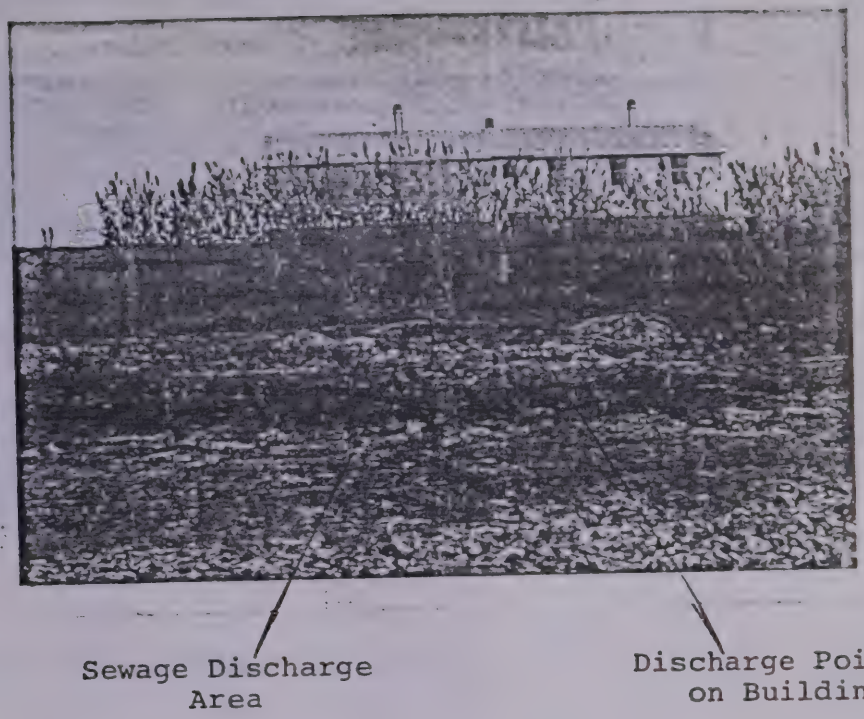


FIGURE 3: NURSING STATION (from river side)

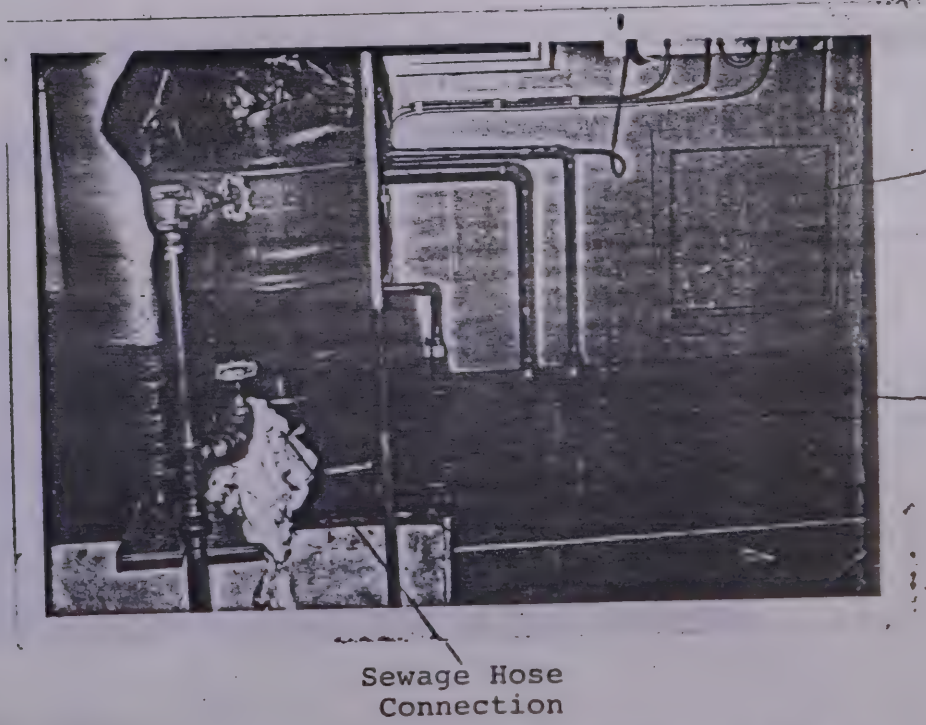


FIGURE 4: SEWAGE PUMP-OUT LOCATION IN R.C.M.P. DETACHMENT UTILITY ROOM

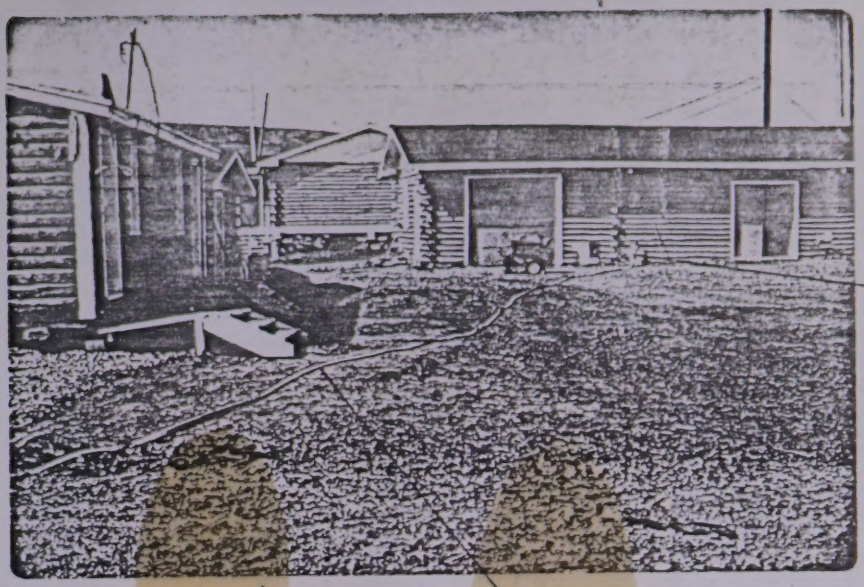


FIGURE 5: SCHOOL SEWAGE DISCHARGE

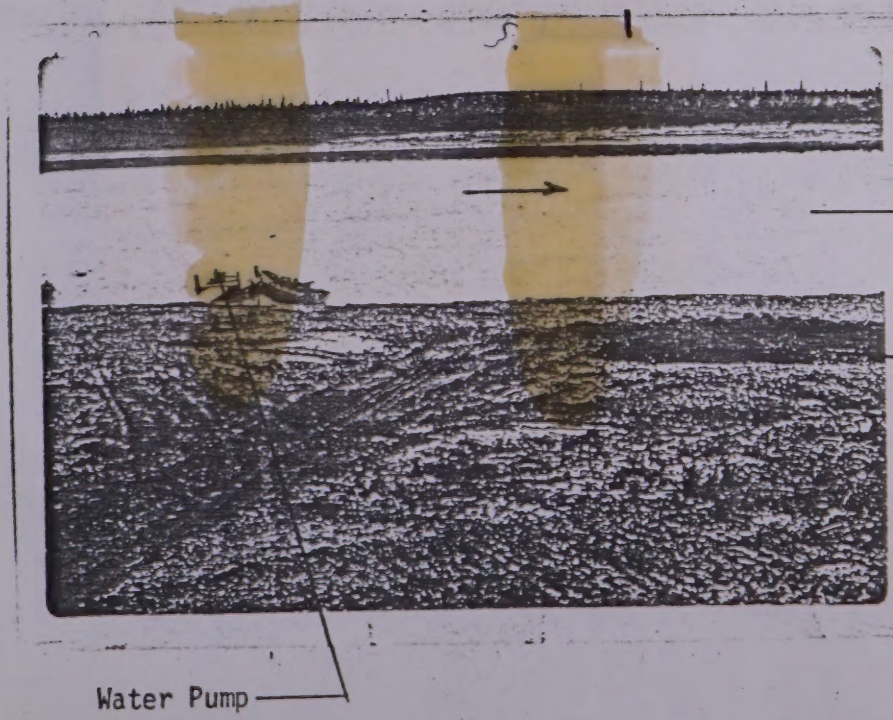


FIGURE 6: WATER SUPPLY AND SCHOOL SEWAGE DISPOSAL SITE

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